Momentum

define: Momentum, Impulse, law of conservation of momentum, elastic collision, inelastic collision

Momentum: for an object with mass, p=mass times velocity
p=mv units: kgm/s
(electromagnetic radiation $p=h/\lambda = hf/c$)

Impulse: $\Delta p = F_{net}\Delta t$ change in momentum caused by the net force action over a period of time. $F_{net}= ma = m\ \Delta v/\Delta t = \Delta p/\Delta t$ kgm/s or Ns
$F_{net}= ma$ is not valid for changing mass problems: snow accumulating problems, rockets, relativistic but $\Delta p = F_{net}\Delta t$ is valid because people can use the calculus to find the area under the F-t graph

Law of conservation of momentum:
The vector sum of the momentum of all the particles in a system is conserved through collisions and explosions if the system is closed and isolation(no objects in/out no external unbalanced forces)
explosion - energy put into the system
elastic - bounce off (might mean perfectly elastic)

perfectly elastic collision - the sum of the kinetic energies (not a vector) is conserved

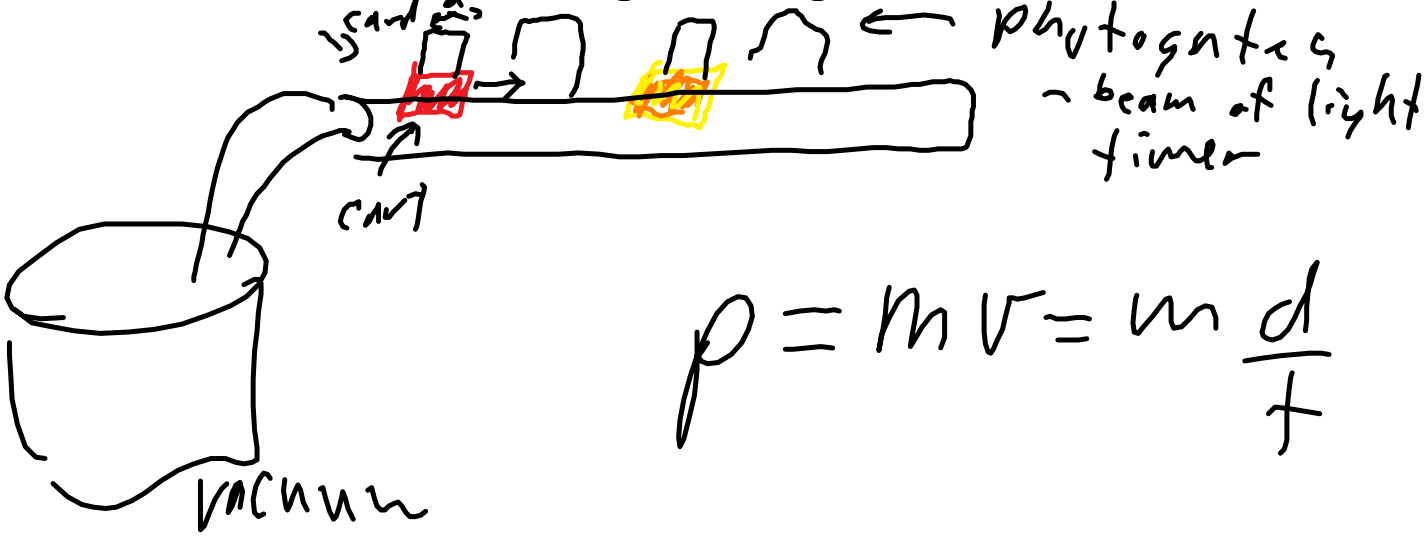
inelastic - stick together

eg. 1. A 1.0kg cart and a 2.0 kg cart have a spring between them and are at rest. You let them go and the 1.0 kg cart moves off at 4.0 m/s after pushing on the 2.0kg cart for 0.40s.

a) what's the momentum of the system before and after?
b) what's the velocity of the 2.0kg cart after?
c) what's the average force on each cart?
d) if the force decreases linearly with time, sketch a F-t graph (area under the graph = impulse)

2. On an air track a red cart mass

Red cart: mass: 41.59g Length of card: 5.9cm
Gold cart: mass: 84.34g Length of card: 8.3cm



$$p = mv = m\frac{d}{t}$$

part 1. red cart hits the yellow cart and stick together.
time red before:_0.0377s time gold after_0.1820

time red after:_0.1269s_
part 2 red cart hits the yellow cart and bounces back
time red before:_0.0438s_time gold after 0.1123s_time red after:0.3047s
determine if momentum and kinetic energy are conserved in each collision

p168 problems: 7, 15, 17